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Signed K E Behen

Dated 7 July 2003

Patents Form 1/77

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1/77

31JUL02 E737184-1 D00041
P01/7700 0.00-0217606.3

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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference — REP07133GB

2. Patent application number *(The Patent Office will fill in this part)* — 30 JUL 2002 — 0217606.3

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

   Rayner Intraocular Lenses Ltd.
   1-2 Sackville Road Trading Estate
   Hove
   East Sussex
   BN3 7AN

   08436968001
   Patents ADP number *(if you know it)*

   If the applicant is a corporate body, give the country/state of its incorporation — United Kingdom

4. Title of the invention — Intraocular Lens

5. Name of your agent *(if you have one)* — Gill Jennings & Every

   "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

   Broadgate House
   7 Eldon Street
   London
   EC2M 7LH

   Patents ADP number *(if you know it)* — 745002

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
   a) any applicant named in part 3 is not an inventor, or
   b) there is an inventor who is not named as an applicant, or
   c) any named applicant is a corporate body.
   See note (d)) — YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	3
Claim(s)	1
Abstract	
Drawing(s)	4 + 4

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	NO

11. For the applicant
Gill Jennings & Every

I/We request the grant of a patent on the basis of this application.

Signature

Date
30 July 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

PERRY, Robert Edward
020 7377 1377

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*

e) *Once you have filled in the form you must remember to sign and date it.*

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INTRAOCULAR LENS

Field of the Invention

This invention relates to an intraocular lens which, in use, inhibits posterior capsular opacification.

Background to the Invention

Posterior capsular opacification (PCO) is a common long-term complication of cataract surgery. During cataract surgery, the central anterior lens capsule is removed and the natural lens replaced with an artificial intraocular lens. The posterior lens capsule remains intact. After surgery, epithelial cells of the natural lens may remain in the lens capsule. These cells can migrate across the inner surface of the posterior capsule, causing it to opacify. The effect, PCO, is similar to a cataract and for this reason is sometimes called "secondary cataract". PCO is age-related, occurring more in children rather than adults.

The standard treatment for PCO is neodynium: yttrium-aluminium-garnet (YAG) laser posterior capsulotomy. The laser is used to create an opening in the centre of the posterior capsule, to produce a clear area for light to reach the retina. Although the procedure is non-invasive, complications such as retinal detachment and lens damage may arise.

EP-A-0962196 describes an intraocular lens wherein the haptics are shaped such that, in a first stage of compression, the proximal part of the haptic can be fully compressed; and in a second stage, the distal part of the haptic can be compressed, to provide a lens that is eventually resistant to haptic failure.

A number of lenses for the prevention of PCO have been proposed, but on the whole, little if any reduction in PCO has been achieved. There still exists the need for an intraocular lens which is effective at reducing the PCO.

Summary of the Invention

An intraocular lens of the present invention comprises an optic and one or more curved haptics that can be compressed in the plane of the lens. The lens further comprises, around the optic, an annular member having an annular rim that, in use, the rim is in contact with the posterior capsular sac. The annular member preferably comprises an annular rim on both the posterior and anterior surfaces of the lens.

The thickness of the annular lens is preferably greatest in a region proximal to the or each haptic. This allows easier folding of the lens and insertion through a smaller incision.

Preferably, the or each haptic is curved and shaped such that, in a first stage of compression, the proximal part of the haptic can be fully compressed, and, in a second stage, the distal part of the haptic can be compressed. This two-stage compression has been shown to be particularly effective in maintaining contact between the rim and the sac.

A lens of the invention may retard PCO. It is proposed that haptic compression allows contact between the rim of the optic and the posterior chamber to be maintained, thus preventing the migration of epithelial cells into the posterior lens region.

Brief Description of the Drawings

In the accompanying drawings (which are given by way of example only):

Figs. 1A and 1B are respectively plan and cut-away side views of an intraocular lens embodying the present invention.

Fig. 2 is the same as Fig. 1B except that the posterior capsular sac is also shown.

Figs. 3A to 3C are side views of intraocular lenses which, with the exception of Fig. 3C, embody the present invention.

Figs. 4A and 4B are similar to Figs. 1A and 1B, except in that the thickness of the annular rims is greatest in the region of the optic binding the haptic.

Description of the Preferred Embodiments

Embodiments of the invention will now be described by way of example only, with reference to the accompanying drawings.

Figs. 1A and 1B show an intraocular lens having an optic 1, comprising convex faces 2a and 2b and haptics 3a and 3b. Each haptic comprises an aperture, 4a and 4b. Opposed points of each haptic 5a and 6a, and 5b and 6b, are shown.

These features are such that initial compression of the haptic leads to abutment of opposite walls of the aperture, bringing the opposed points into contact, thereby defining a proximal part that is fully compressed and a distal part that can undergo further compression. Such further compression brings the

distal end of each haptic substantially into contact with the periphery of the optic, to give an essentially elliptical shape, in plan.

Figs. 1A and 1B also show annular rims 7a and 7b on the anterior and posterior faces of the optic respectively. The periphery 8a of the anterior optic face is also shown.

Fig. 2 is similar to Fig. 1B except in that the surface 9 of the posterior capsular sac is also shown. The haptics hold the capsular sac tight against the posterior annular rim, such that epithelial cells 10 are prevented from migrating to the optic region. This inhibits the onset of PCO.

Figs. 3A and 3B show lenses of the invention. Both lenses comprise a biconvex optic 1, having an anterior face 2a and a posterior face 2b. The lenses comprise compressible haptics 3a and 3b, and annular rims 4a and 4b. In each case, the posterior capsular sac 5 compresses the haptics, such that the posterior annular rim 4b is held tight against the posterior sac. The lens of Fig. 3A is of higher power than that of Fig. 3B, and requires a thicker annular rim since the biconvex optic is wider.

Fig. 3C shows a conventional planar haptic PCO retarding lens. Instead of comprising an annular rim, the edge surfaces of the optic in contact with the haptic (6a and 6b) are effectively tapered. These tapered edges fail to prevent cell migration since there still exists gaps between the posterior capsular sac and the lens edge. Cells may migrate through this gap, resulting in PCO.

Figs. 4A and 4B are similar to Figs. 1A and 1B, except in that the thickness of the annular rims is greatest in the region of the optic binding the haptic.

The size of the annular member is preferably minimised to allow the optic to be as large as possible. Intraocular lenses are generally inserted into the eye using an injector; in this case, a lens of the invention must be able to withstand the forces of injection.

A lens of the invention may comprise an optic of negative and/or positive powers. Typical negative powers, but not limited thereto, are -10 to -1 Diopters. Typical positive powers but not limited thereto are +1 to +34 Diopters.

Since the shape/size of the annular member is proportional to the power of the optic, it may be possible to express this relationship mathematically. This may allow the annular member size to be calculated simply by determining a patient's optical power.

CLAIMS

1. An intraocular lens comprising an optic and one or more haptics, wherein the or each haptic can be compressed in the plane of the lens, and which additionally comprises, around the optic, an annular member having an annular rim that, in use, is in contact with the posterior capsular sac.

2. A lens according to claim 1, wherein, in use, the optic does not touch the posterior capsular sac.

3. A lens according to claim 1 or claim 2, wherein the thickness of the annular rim is greatest in a region proximal to the or each haptic.

4. A lens according to any preceding claim, wherein the annular member comprises an annular rim on the anterior surface of the lens.

5. A lens according to any preceding claim, wherein the or each haptic is curved, and shaped such that, in a first stage of compression, the proximal part of the haptic can be fully compressed, and, in a second stage, the distal part of the haptic can be compressed.

6. A lens according to claim 5, wherein the or each haptic includes an aperture of which opposed points are brought into contact, in the first stage of compression.

7. A lens according to claim 5 or claim 6, wherein the or each stage of compression is essentially continuous, full compression being reached gradually from the proximal end towards the distal end of the haptic.

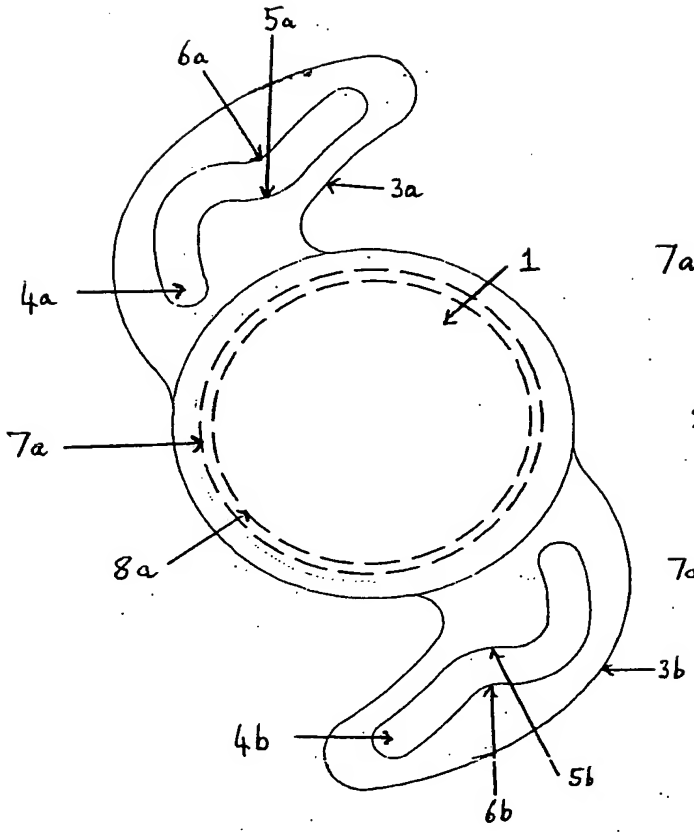

Fig. 1A

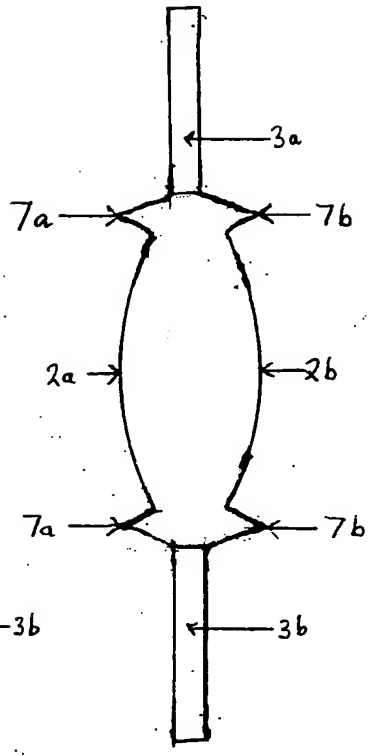

Fig. 1B

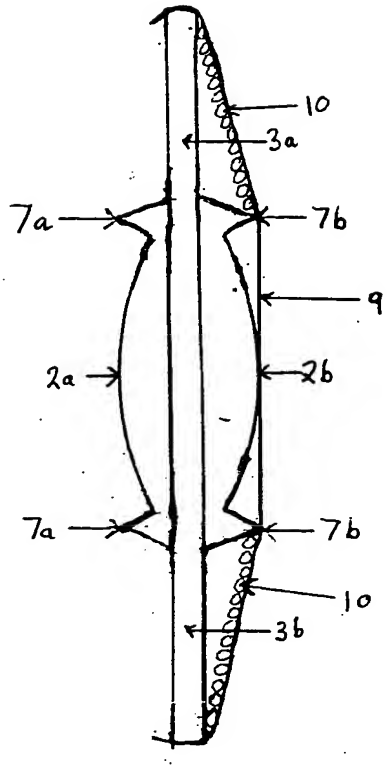

Fig. 2

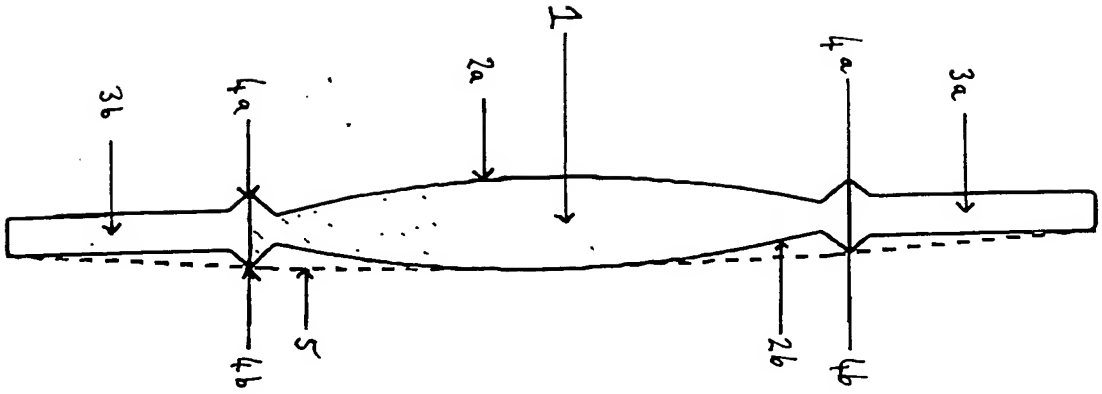

Fig. 3A

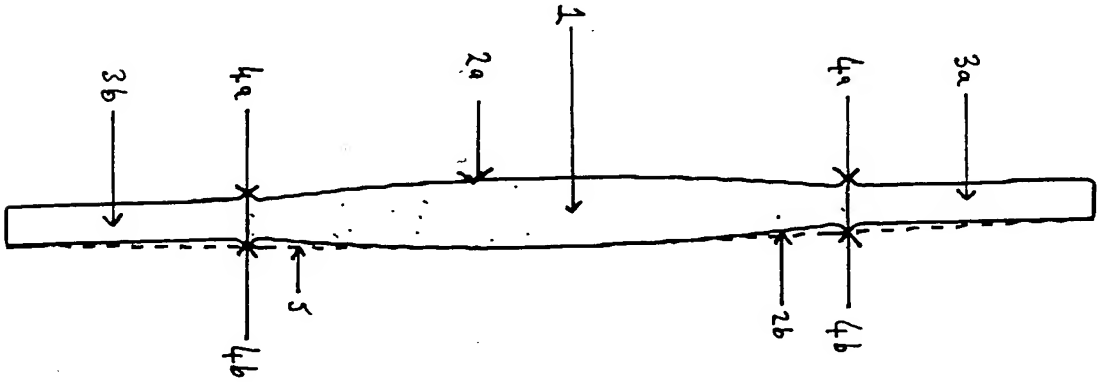

Fig. 3B

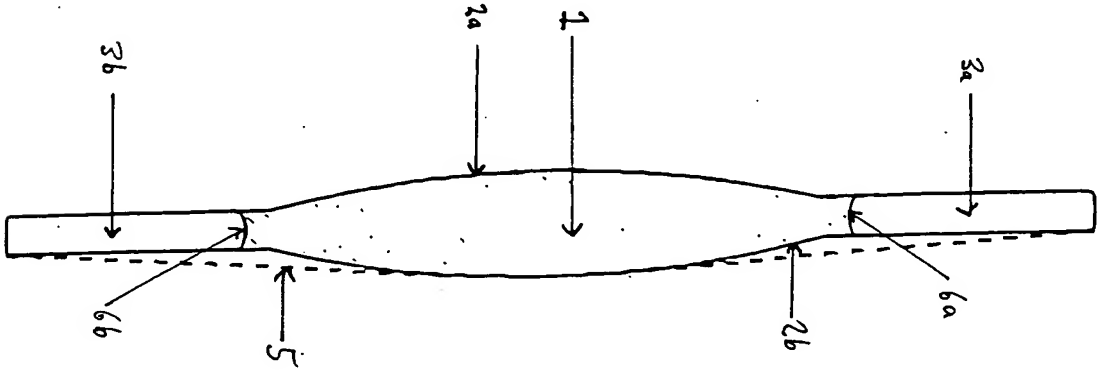

Fig. 3C

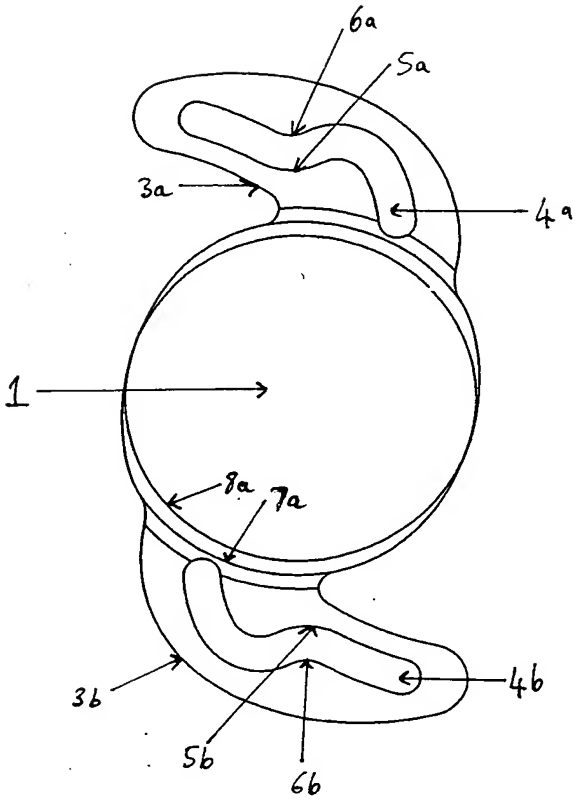

FIG. 4A

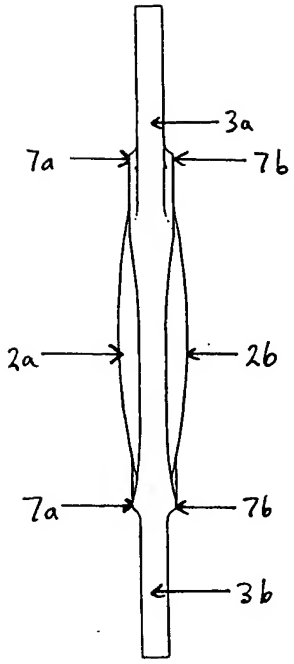

FIG.4B